

## CLAIMS

We claim:

1. A personal simulator comprising:

A support plate;

A pedestal support rigidly connected to said support plate at one end and having a coupling joint at the other end;

A motion plate for supporting a rider, said motion plate coupled to said coupling joint; and

A plurality of drive assemblies mounted on said support plate, each of said drive assemblies having a motor coupled to said motion plate by a drive arm linkage and a controller for generating a motor control signal to reposition said motion plate by changing the relative orientation of said drive arm with respect to the other drive arms.

2. The personal simulator of claim 1 further comprising a display device positioned proximate to said motion plate.

3. The personal simulator of claim 2 further comprising means for generating audio/video signals for display on said display device and motion control signals indicating a desired position of said motion plate.

4. The personal simulator of claim 3 wherein said controller comprises:

Means for receiving motion signals synchronized with said audio/video signal; and

Means for generating a frequency modulated signal for driving said motor.

5. The personal simulator of claim 4 wherein said controller further comprises means for increasing motor torque at low speed.

6. The personal simulator of claim 4 wherein said controller further comprises means for increasing motor torque at zero speed.

7. The personal simulator of claim 1 wherein said controller comprises:

Means for generating a frequency modulated signal for driving said motor;  
and

Means for maintaining torque within a selected range while operating said motors at low operating speeds.

8. The personal simulator of claim 1 wherein said plurality of drive assemblies comprise a first and a second drive assembly coupled proximate to respective first and second adjacent corners of said motion plate and a third drive assembly coupled midway between adjacent corners opposite from said first and second adjacent corners.

9. The personal simulator of claim 1 wherein said plurality of drive assemblies comprise at least three drive assemblies connected to said support plate in a generally triangular configuration.

10. The personal simulator of claim 1 wherein said pedestal support is coupled to the center of said support plate and said plurality of drive assemblies comprise at least three drive assemblies connected to said support plate in a generally triangular configuration proximate to the periphery of said support plate.

11. The personal simulator of claim 1 wherein said support plate comprises a rigid metal plate capable of supporting a static load of at least 300 pounds.

12. The personal simulator of claim 11 wherein said support plate further comprises ballast.

13. The personal simulator of claim 1 wherein said motors each comprise a fractional horsepower AC electric motor.

14. The personal simulator of claim 1 wherein each of said drive assembly further comprises:

A fractional horsepower electric motor having a drive shaft;

A gearbox coupled to the drive shaft;

Means for detecting the position of said motion plate coupled to said gearbox; and

A rectangular crank connected to said gearbox at one end and to said drive arm linkage at the other end.

15. The personal simulator of claim 14 wherein said drive arm linkage further comprises:

A lower eyebolt;

A first rod end connector, connected to said lower eyebolt, for rotatably coupling said drive arm linkage to said crank;

An upper eyebolt;

A second rod end connector, connected to said upper eyebolt, for rotatably coupling said drive arm linkage to said motion plate; and

A rigid push rod connecting said upper eyebolt to said lower eyebolt.

16. The personal simulator of claim 15 wherein said motion plate comprises:

A flange coupled to said upper eyebolt by said second rod end connector; and

Means for coupling said motion plate to said universal joint.

17. A single person motion simulator comprising:

A display device for displaying a video signal;

Means for supporting a person proximate to said display device;

Means for positioning said support means in at least three axis of motion synchronized with said video signal, said positioning means including at least three fractional horsepower AC motors coupled to said supporting means; and

An enclosure surrounding said support means and said control means;

18. The single person motion simulator of claim 17 wherein said controller comprises:

Means for receiving motion signals; and

Means for generating a frequency modulated signal for driving said AC motors.

19. The single person motion simulator of claim 18 wherein said controller further comprises means for increasing motor torque at low speed.

20. The single person motion simulator of claim 18 wherein said controller further comprises means for increasing motor torque at zero speed.

21. The single person motion simulator of claim 18 wherein said controller generates a pulse width modulated signal having a variable AC voltage and variable frequency and said fractional horsepower AC motor averages said pulse width modulated signal so that said has the same operational effect on said fractional horsepower AC motor as an analog sine wave signal.

22. A simulator system having a platform for positioning a rider and for displaying audio and video signals to said rider, said simulator system comprising:

Computer means for generating said audio and video signals and motion control information synchronized with said audio and video signals;

A motion platform including:

Linkages, coupled to said motion platform, for controlling the pitch, roll and heave of said motion platform;

A plurality of motors, coupled to said linkages for controlling said linkages;

A controller, associated with each motor, coupled to said computer means and adapted to receive control information from said computer means, said controller, in response to said control information generating motor control signals to position said motion platform.

23. The simulator system of claim 22 wherein each of said motors comprises a fractional horsepower AC motor.

24. The simulator system of claim 23 wherein said controller generates a pulse width modulated signal having a variable AC voltage and variable frequency for controlling said fractional horsepower AC motors.

25. The simulator system of claim 23 wherein said controller is adapted to selectively increase the torque of said fractional horsepower AC motors.

26. The simulator system of claim 23 wherein said controller further includes means for storing regenerative power generated by said fractional horsepower AC motors.

27. A personal simulator system for spatially positioning a rider and for displaying audio and video signals to said rider, said simulator system comprising:

A motion platform supported by a pedestal and a plurality of linkages, said motion platform adapted to receive and retain said rider in proximity to said displayed audio and video signals;

Means, coupled to said linkages, for controlling the positioning of said motion platform responsive to and synchronized with the displayed audio and video signals.

28. The personal simulator system of claim 27 further comprising:  
means for storing regenerative energy developed by a change in direction of said motion platform.

29. The personal simulator system of claim 27 wherein said controlling means further comprises:

A plurality of controllers, each of said controller dedicated to one of three axis of motion of said motion platform, for receiving a positional reference and calculating the difference between the current position of said motion platform and the positional reference, said controller determining the rate of change necessary to achieve said positional reference;

A plurality of fractional horsepower AC motors, each coupled to one of said plurality of controllers for generating torque for changing and maintaining the position of said motion platform; and

Means for coupling said plurality of fractional horsepower AC motors to said plurality of linkages.

30. The simulator system of claim 29 wherein each of said plurality of controllers generate a pulse width modulated signal having a variable AC voltage and variable frequency for controlling the associated one of said plurality of fractional horsepower AC motors.

31. A personal simulator system for spatially positioning a rider and for displaying audio and video signals to said rider, said simulator system comprising:

A motion base adapted to receive and retain said rider;

A motion control device

Means, coupled to said motion base and said motion control device, for controlling the positioning of said motion base in response to commands generated by said rider.

32. The personal simulator system of claim 31 wherein said controlling means comprises:

Means for detecting a motion request; and

Means for converting detected motion requests to motion commands, said converting means coupled to said motion base.

33. The personal simulator system of claim 32 wherein said motion base comprises a two-axis motion base where each axis is controlled by a fractional horsepower electrical motor.

34. The personal simulator system of claim 32 wherein said motion base comprises a three-axis motion base where each axis is controlled by a fractional horsepower electrical motor.

35. The personal simulator system of claim 32 wherein said motion base comprises a four-axis motion base where each axis is controlled by a fractional horsepower electrical motor.

36. The personal simulator system of claim 32 wherein said motion base comprises a four-axis motion base where each axis is controlled by a fractional horsepower electrical motor.

37. The personal simulator system of claim 32 wherein said motion base comprises a five-axis motion base where each axis is controlled by a fractional horsepower electrical motor.

38. The personal simulator system of claim 32 wherein said motion base comprises a six-axis motion base where each axis is controlled by a fractional horsepower electrical motor.

39. The personal simulator system of claim 31 further comprising:  
A game box for generating a game where a series of linked scenery images are displayed, said game box coupled to a plurality of remote players and to said motion base;  
A game pad for generating rider input associated with said game generated by said game box; and  
A programmable interface circuit, coupled to said game pad and to said game box for converting changes in said plurality of linked scenery images to motion and for controlling said motion base to track the changes in said linked scenery images.

40. The personal simulator system of claim 39 wherein said motion base comprises a two-axis motion base where each axis is controlled by a fractional horsepower electrical motor.

41. The personal simulator system of claim 39 wherein said motion base comprises a three-axis motion base where each axis is controlled by a fractional horsepower electrical motor.

42. The personal simulator system of claim 39 wherein said motion base comprises a four-axis motion base where each axis is controlled by a fractional horsepower electrical motor.



43. The personal simulator system of claim 39 wherein said motion base comprises a four-axis motion base where each axis is controlled by a fractional horsepower electrical motor.

5 44. The personal simulator system of claim 39 wherein said motion base comprises a five-axis motion base where each axis is controlled by a fractional horsepower electrical motor.

10 45. The personal simulator system of claim 39 wherein said motion base comprises a six-axis motion base where each axis is controlled by a fractional horsepower electrical motor.

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